lateral fores and hind subequal, last strongest; nails stout, moderately curved, acute; tail various, as in *Promerops* or in *Cinclosoma*.

Species 1st. *Pieaoïdes*. Pie-like *Sibia mihi*. Saturate slatey-blue; paler and greyer below; darker and merging into black on the wings and tail; speculum on the secondaries, and tips of the rectrices, white; legs plumbeous; bill black; iris sanguine; tail very long, and gradated conspicuously and equally throughout; head not crested; 14 inches long and as many wide; bill $1\frac{1}{8}$ inch; tarsus $1\frac{1}{4}$; central toe $\frac{3}{4}$; hind toe $\frac{9}{16}$; its nail $\frac{7}{16}$; tail $8\frac{1}{2}$; weight $1\frac{1}{2}$ to $1\frac{3}{4}$ oz. Sexes alike.

Species 2nd. *Nigriceps*. Black-capt *Sibia mihi*. Rusty, with the entire cap and the wings and tail, internally, black; central wing coverts white toward their bases, slatey toward their tips; outer webs of the primaries slatey-grey; of the secondaries and tertiaries, slatey; the last, rusty, like the body; two central rectrices con-colorous with the body towards it, then black; the rest wholly black, and all with broad slatey points; bastard wing black; legs fleshy brown; bill black; iris brown; tail moderately elongated, gradated only in the six laterals; head with a full soft garruline crest; outer web of the secondaries rather enlarged, discomposed, and curled downwards; size $8\frac{1}{2}$ to 9 inches, by $10\frac{1}{2}$ to 11, and $1\frac{1}{2}$ oz. in weight; bill 1 inch; tarsus $1\frac{5}{16}$; central toe $\frac{10}{16}$, and nail $\frac{4}{16}$; hind toe $\frac{7}{16}$, and nail $\frac{6}{16}$; tail $4\frac{1}{4}$. Sexes alike.

3rd. Species. *Nipalensis, nobis*. Described already as a *Cinclosoma*,[1] and forming a singular link of connexion between the *Cinclosomæ* and the *Sibiæ*. I postpone what I have to say upon the habits and manners of these birds to a future opportunity; at present it must suffice to observe, that they are indissolubly linked to the *Meruliдæ* by the nature of their food and manner of taking it.

Nepaul May, 1836.

ART. VI.—*On the Egyptian system of Artificial Hatching.* By DON SINBALDO DEMAS.

Several unfruitful attempts have been made in different parts of Europe since the labours of Reaumur to introduce the artificial mode of hatching eggs. In some parts chickens have been brought forth which have not propagated; in others, for instance in Aranjuez, instead of chickens, hard eggs have been made. Notwithstanding these failures, being persuaded that they proceeded rather from ignorance on the part of the experimentalist than from any real or insuper-

1 Note.—As Soc. Transac. Phy. Class., vol. xix. p. 143.

able obstacle in the nature of the country where the experiments were performed, since my arrival in Egypt I determined to study in person minutely all the proceedings, without trusting to accounts which would always leave me uncertain of the truth. The enterprize was by no means an easy one. Few in Egypt possess the art, and those few make a secret of it. Besides, this first difficulty vanquished, so much patience and perseverance is necessary to remain for 21 days in an oven at 34° of Reaumur, full of the pestiferous smoke of burning dung—contending incessantly with the stupidity and prejudices of the Arabs, who always suspect some sinister motive, and to every thing oppose difficulties, (believing, among a thousand other follies, that the thermometer warms the room in which it is introduced,)—that no traveller before me, that I am aware of, has examined the matter in a satisfactory manner, or has given a circumstantial description of it. Nevertheless, my intimacy with my countryman Gaityany Bey, who rendered me every facility which the Government could offer, my knowledge of the vulgar Arabic language, and my constitution of the south of Europe, enabled me to overcome all the obstacles which hitherto embarrassed all Europeans who attempted to investigate this subject.

Before entering on a description of the process, I will stop a moment to shew that the artificial hatching, practised from time immemorial in Egypt, is not only a curious fact, but an eminently useful one; since it facilitates with surprising rapidity the reproduction and abundance of the fowl, as well as the egg; both of which may be reckoned among the most pleasing and salutary articles of food for man.

The operation is carried on in an oven, generally composed of eight divisions or cells. In each of them 6000 eggs are hatched every 21 days, for the space of $3\frac{1}{2}$ or 4 months. It is admitted that Egypt contains more than 200 of these ovens. Deducting one quarter of the eggs which may be lost, we shall see that this artificial hatching gives $37\frac{1}{2}$ millions of chickens in one third of the year; which again must produce an immense number of eggs,[1] Thus it happens that although latterly the price of all provisions has been doubled in that country, I have bought in Upper Egypt one egg for half a *para*, and the best fowl for a *piastra*.[2] It is to be considered also, that the power of establishing these ovens is given by Government to the highest bidder; and that from this circumstance a considerable revenue is received, which cannot fail to raise the price of the article.

1 In the *Encyclopædia Britannica* the number of ovens is stated to be 360; and the chickens produced 92 millions; which I think at least in the present day is a very exaggerated calculation.

2 One Company's rupee=10 piastras. 1 piastra=40 paras.

To produce 27½ millions of chickens without artificial heat, at least two millions of productive hens would be required in the space of four months!

The artificial mode of hatching does not oppose any obstacle to the natural one, since a hen born by means of the oven, or under the wings of the mother, at every season of the year can as well in Egypt as in any other country cover and hatch its own eggs.

One great inconvenience has been attributed to this method—it is said that the fowl degenerates, and consequently its egg.

This opinion originated in observing that the fowl of Egypt is generally smaller than that of Europe. The fact is true; but I can by no means agree that it is the consequence of artificial hatching. It is to be considered, 1st, That in Egypt several animals are of smaller size than those of other countries. 2d, That the artificial hatching consisting only in applying to the egg the same degree of heat that it might receive under the hen, without changing any of the natural operations, the number of days which it employs in vivifying it, &c. there is no plausible reasons to suppose that the chicken does not under this process attain its natural size. 3d, That there is in some parts of Upper Egypt a large kind of fowl called *bigany* or *dinderany*, and its eggs placed in the oven produce fowls equal in size to the mother. 4th, and to me the most convincing argument of all—if the action of fire could so reduce the fruit of the egg during its development, other circumstances being the same, the same cause must continue to operate every year, and small as this annual diminution may be considered in the number of ages that this method has been practised, (we find artificial egg hatching mentioned by Herodotus,) the fowl of Egypt ought to be reduced by this time to the size of a fly at least. Lastly, even admitting the hypothesis of degeneration, we must admit that the decrement has operated in a very slow and imperceptible manner. This diminution being so inconsiderable, can by no means neutralize the beneficial results of artificial hatching.

The economy and benefit that this method is capable of diffusing among those who practise it being sufficiently demonstrated, I will proceed to give a circumstantial narrative of all the steps of the operation, as I have seen it practised in the ovens established in Ghisa, a suburb of Cairo, situated upon the right shore of the Nile.

The building is composed of a corridor with vaulted roof 40 feet long and 5 broad (A B C D, fig. 1st) The vaulted roof has five small apertures to give light. In the centre, to the right hand, there is a door of 3½ feet high and 2½ broad (E, fig. 1st); this leads to another corridor (F G H I, fig. 1st) 48 feet long by 5 broad, also with vaulted

roof, in the centre of which there are three apertures (J K L, fig. 2nd) of nine inches in diameter, to give light from above; to the right and left hand of the corridor there are five divisions or cells of two stoves. Each inferior room or stove has an aperture of $1\frac{1}{2}$ feet square (M, fig. 2nd). The superior room has another aperture above of two feet five inches in height, and one foot nine inches broad (N, fig. 3rd); it has also an aperture of one foot square in the wall of the right hand, and another of equal size in the left, which I have seen constantly stopped up with tow (d, fig. 4th). The walls of the said upper stove begin rectangular from the ground, finish in a vault of $6\frac{1}{2}$ feet high (O, figs. 3rd and 4th), with a hole in the top of nine inches diameter (P, figs. 3rd and 4th). The ground of this room is nine feet long and eight broad (X Z V U, fig. 5th) and has in its breadth, that is to say in the same direction with the corridor, two grooves (Q Q, R R, fig. 5th.) of nine inches broad and two deep, and in the centre an aperture almost round of two feet in diameter (S, fig. 5th). The first room entering to the right hand is destined to keep a fire always kindled; it has only one stove, and its door is larger than the others (T, fig. 2nd). The first room to the left hand has no hole in the ground of the upper stove, but only a fissure of two feet, which separates the ground from the interior of the wall, to which it is notwithstanding united by several iron bars in the form of an oblique grate, (b, fig. 6th.) In this cell the materials destined for combustion are thrown through the hole in the top. They pass through the grate as through a sieve, and are taken away by the inferior aperture to be transported to the opposite cell which contains the magazine of fire.

There are, lastly, to the left hand of the exterior corridor two rooms 15 feet square, with vaulted roofs of 12 feet high, with an aperture in the top; they are intended for the preparation of eggs, as well as a place for chickens recently born, &c. (f and g, fig. 1st).

The material for constructing the oven, is the same employed generally in Egypt for the houses of the peasants; that is to say, mud mixed with straw. The vaults are constructed with burnt bricks. The ground which divides the cell in two stoves is sustained upon two trunks of palm trees parallel to the corridor, and a bed of branches of the same tree supported by the said trunks. Upon this entablature is spread the mud which forms the ground whereon the fire is placed.

A little straw or tow is prepared on the ground of the inferior room; upon it a mat is placed, and upon the mat 6000 eggs,

which are not more than twenty-one days old, taken from a hen-yard in which there is a cock.

For combustibles the dry dung of animals is used, which the Arabs reduce to small pieces with their hands; this material they call بيمس *(dims)*. In the first room to the right hand two pyramids of burning *dims* are formed, covered with common earth. The *dims* must take fire slowly, without making a flame. It is taken up with a fire shovel, put on to a plate of baked earth, and afterwards placed in the grooves (Q Q, R R, fig. 5th) which have been first half-filled with cold *dims*. Again a little *dims* is placed upon the burning portion, and upon the whole a little earth is strewed. The burning *dims* which is taken from the magazine is continually replaced with an equal quantity of cold material.

On the morning of the day destined to begin the operation the fire is placed in the cell to warm it, and at sunset the 6000 eggs are disposed in the manner explained. The fire is renewed three times a day—at dawn, at midday, and at sunset; there is however no very religious exactitude observed in this. If the fire put on in the evening is yet alive at the dawn of the subsequent day, it is left, and is not renewed till midday. In one instance, which I saw, being ready about 12 o'clock to put on the fresh fire, a quarrel happened, and it was not put on till 3 o'clock. At sunset it was not renewed, and this *dims* lasted till the dawn of the subsequent day.

When the new fire is put on, the door of the superior stove is left open, also the hole of the vault, and if the fire is too strong, even the small door of the inferior stove. The aperture in the ground of the superior stove is always covered, as well as the two apertures in the walls to the right and left hand. When the heat begins to mitigate and the smoke to disappear, all the small doors of the inferior stove are stopped up, afterwards the hole at the top of the vault, and lastly the door of the superior stove, which is not generally stopped. The doors of all these apertures are merely handsful of tow for each. When the fire is recent, and the heat at its greatest strength, the thermometer marks 33° or 34° of Reaumur. When the fire is extinct, and before it is renewed, the heat is 30° sometimes as low as 29°.* Six or

* *Reaumur.* *Fahrenheit.* *Centigrade.*

24	=	86	=	30
28	=	95	=	35
32	=	104	=	40
36	=	113	=	45

seven times every twenty-four hours the operation that I am going to describe is practised.

A man entirely naked enters by the door (N, fig. 2nd); he either carries a light in his hand or he opens the hole of the vault to procure light; he opens also the round hole in the centre of the ground, and comes down through it to the inferior stove. He carries all the eggs placed on the side V fig. 7th to the side U; and those of the side U to the side V. The eggs placed under the central hole are found sensibly colder than those placed at V and U, and these latter not so warm as those of the sides X and Z. Generally they are heaped toward the corners. This operation is very necessary not only to apply the heat to all the points of the egg, but to apply it in the same proportion to all the eggs, so that development may not be effected sooner in one than in another. This removing of the eggs is performed during the day, and several times during the night. Thus the affair proceeds till the 7th day. On this day, as on the 8th, the whole of the groove before the door R R, fig. 5th, is not filled with fire, but only 2 or $2\frac{1}{2}$ feet near the entrance. By these means the heat is diminished gradually; and during these two days the thermometer at its greatest height marks only 32° or 31° of Reaumur. After the 8th day fire is no longer placed in the room. We should naturally expect that the cell unprovided with fire would return to the natural temperature of the surrounding air, but it is not so. We have already said that in the oven there are eight cells destined to the process of hatching. Three or four days after that on which the eggs have been put in the first room, they are placed in the second, and so on successively. The consequence is, that though one or two cells may be without fire, the others contain it; besides which fire is always burning in the chambers wherein the fuel is prepared, the door of which is never stopped, while its temperature ranges from 36° to 38°. All these fires produce a degree of heat which diffuses itself through the whole building, and maintains even in those rooms which are without fires a temperature varying from 27° to $27\frac{1}{2}$°. On the 14th day another operation is performed. Half the eggs are left in the inferior room (fig. 8th) and the other half are brought to the upper one upon a circular bed of tow (fig. 9th); in this way they continue wrapping them up two or three times a day, but without bringing down those from above, or carrying up those from below. To this operation of dividing the eggs they do not attach much importance. During my observations of the operation, this division was not executed till the 16th day, because they had no tow ready to prepare the circular bed with. When the eggs are divided, the man does not enter again through the

door of the superior stove, but through that of the inferior one, arranging the eggs below ; afterwards standing up he pushes his head and arms through the hole of the roof, and arranges those above.

The eggs which have not been in the oven eight days they call صري *(el tari) the fresh.* I have eaten some of them after two or three days baking, and they were good. Towards the sixth or seventh day, they look at them before a light. If the egg appears opaque and obscure, it is inferred that the operation will succeed; on the contrary, if it is transparent and white, they conclude that the chicken will not be formed. The people who keep the oven eat these eggs or sell them. They have the appearance and taste of boiled eggs. Those which go on without fire after the eighth day they call ملوح *(meláh) the good.* Lastly, those which have continued more than twelve days in the cells they call المسكوا *(el mésku) which has taken* ; or that wherein the chicken is already formed. The cells where eggs are divided half below and half above, as they are placed after the fourteenth day, have their doors constantly stopped with great care. During the last days of the process the hole of the top of the vault is not only stopped with tow, but with a great deal of earth upon the tow. Four or five days before the end of the operation, the door in the upper stove being open, as well as the hole of the vault, the thermometer indicates 26°, the hole being stopped 27½°, and the door being stopped 27°. Two days before the birth of the chicken, being all well stopped, the temperature reached to 28°, and the day before to 28½°. At the moment that the chickens are coming to life the heat is 28½° ; and in the inferior stove, in which there are about a thousand recently born, 30° ; an augmentation which proceeds no doubt from the animal heat of the young birds, since there is no fire in the room, nor has there been any in it for thirteen days.

It is also curious to observe that the temperature varied during the last few days ; this probably is the effect of the animal heat which begins to develope itself in the inside of the eggs.

If we reconsider all the facts I have detailed, we shall see that the hatching of which we are speaking, consists only in applying to the egg equally and regularly during twenty-one complete days, a degree of heat which beginning with 33° or 34° of Reaumur, falls to 27½° or 27°, and rises again to 28° or 29° with the help of the animal caloric, produced by nature in the process of hatching.

As soon as the chickens are born, the egg-shells are thrown away. The eggs of the inferior stove are carried to the upper, and the chicken to the inferior, which is reserved for them. These are treated with

very little care. They take them up in handsful and throw them below. Here they remain till the subsequent day, on which they are draw out to the corridor, where they pass some hours ; sometimes one whole day. After this they are carried in covered baskets to particular houses, as will be explained, where they begin to eat ground corn or hard eggs. During the day they are exposed to the sun ; before sunset they are carried to a room to be sheltered from the cold. The Arabs *never* help the chicken in breaking the egg-shell.

During the hatching at which I was present, the natural temperature in the shade varied from 13° to 16° ; the day on which the chickens were born it was 16°, and the thermometer exposed to the sun about midday marked 29°. On the subsequent day, under the same circumstances, it rose to 33½°. The weather was always perfectly fair excepting the fifteenth day, on which a little rain fell during the night. All the apertures were on that occasion well shut up, and the dampness produced no bad effects.

I have always placed the thermometer in the upper stove (n. fig. 3) in which the fire existed. That which served me for these observations compared with others of Reaumur's, was found to be rather lower than these.

The oven in which I studied this description, began its labours on the 2d of February last. Generally they begin fifteen or twenty days later. The hatching season closes in the month of June at the latest.

In the midst of summer the sun is more powerful, and the eggs more abundant and cheap. Why, then should this operation be practised in the spring ?

To give a satisfactory answer to this objection, there must be facts of which I am not possessed, never having had either opportunity or time to set one of the ovens in operation during the hot season. However I am fully convinced in my own mind that spring is the season best calculated for this operation in Egypt, according to the present mode of working ; for the first inventors of these ovens would not have fixed upon this season but through experience, having no doubt made repeated trials.

Where facts are wanting, conjectures founded on observations and reason, may frequently in a great measure supply the deficiency ; I shall therefore state what I conceive to be the reasons for giving spring the preference to summer in the lighting of the ovens.

1. During the spring months a hot southerly wind prevails, which ceases at the commencement of summer, yielding to a strong, cold, northerly one ; this fills the whole atmosphere with dust and fine sand, of which there is such abundance in Egypt ; it is therefore im-

possible that the little tender chickens just hatched should be able to withstand the inclemency of such weather; whereas if hatched in spring, they become strong enough before summer sets in.

2. The great difficulty of collecting a sufficient quantity of fresh eggs during the summer, must be a decided objection for putting them into the ovens at that time, for in five or six days all the eggs become spoilt, and it takes some time to gather the required number of eggs; indeed this is the reason which the natives themselves assign when questioned on the subject.

Whatever may be the weight attached to these opinions, yet the very circumstance of this artificial hatching being practised in spring furnishes us with a strong proof that its introduction not only in hot but in temperate climates is feasible.

In this firm conviction, and with the anxious desire of its adoption in other countries with success, I shall venture to offer a few remarks which I trust will be profitable.

Without waiting to shew the different modifications and improvements of which the Egyptian ovens are capable, I shall only mention that the system of large ovens is subject to many inconveniences.

1. This work becomes a monopoly to a few, and Government consequently levy a tax on the establishment.

2. The collecting of so many thousand fresh eggs becomes a work of labour and expense.

3. Taking care of the newly-hatched chickens would be attended with immense trouble and loss; for at sunset they must be placed in a warm room, their food and drink must be attended to, and cleanliness, and other little cares, must not be neglected to rear them, whilst the oven-keeper must be looking after more fresh eggs to continue his subsistence. In fact, these serious inconveniences have been felt and remedies adopted.

In some districts people bring eggs to the ovens on their own account; these they mark with ink or otherwise, and pay the proprietor for the use of the oven and his superintendence, taking the chickens away when hatched.

In other districts Government allot six or eight villages for the exclusive use of the oven-proprietors, to whom alone the villagers must sell the eggs. In this case the proprietor farms out a certain number of chickens to several poor families, either paying them when the fowls are sold for the trouble of rearing them up, or receiving back generally one half for the number of chickens given; the persons taking as many above that number as they may have succeeded in rearing, as a compensation for their trouble.

A small oven worked by a single family on their own risk and profit, would be free from these inconveniences, and no doubt would remunerate them for their labour and expense.

An oven for that purpose ought to be of a rectangular shape, made of baked clay, 3 feet high and 3 feet broad, and from 4 to 6 feet long, with a double roof, so that the fire might be spread evenly on the whole. The lower roof should have a hole to allow of the heat passing into the oven where the eggs are. The upper roof must have an aperture for the smoke to issue, and if necessary to lessen the heat, and also for the purpose of introducing a thermometer. This aperture should be made like the lid of a box to lift up, for the greater convenience of removing the ashes, and renewing the fire; one of the walls of the oven should be made to open to admit of the hands being introduced to remove and shift the position of the eggs.

This oven moreover must be kept in a closed room, out of the way of any current of air; while the room where the oven is placed would be further useful for keeping the newly-hatched chickens till they gain strength.

Perhaps it would be an improvement if the oven were made with a double wall an inch or two apart, and the space filled up with some non-conductor of caloric, such as cork or triturated charcoal.

I think that any potter could make such an oven for the sum of five or ten shillings, and that this artificial hatching might thus be carried on in almost every country house, on a small scale, at all seasons of the year, particularly summer, with successful results. A high temperature must of course be more favourable than a low one for this process. In Egypt itself this fact is acknowledged by a common proverb among the people,

اَلكتكوت الفول ياكل ويموت كتكوت التوت ياكل ويموت
كتكوت المزمح وياكل وينفرح

"The chicken of the bean (i. e. the chicken hatched at the season of beans) eat and die; the chicken of the mulberry eat and die; but the chicken of the apricot eat and thrive." The season for beans is in February, and that of apricots in May.

Besides this, a curious circumstance once occurred which still more strongly proves that this is the best season for hatching. Three eggs were forgotten, and left in a basket in July in the house of Mr. Aime at Cairo; these were hatched spontaneously, and produced three chickens which thrived. Why should not then two or three hundred in a small oven succeed?

Before I conclude this brief account, I would just mention that this artificial mode of hatching will apply equally to turkey's eggs. Several Europeans had put them into the ovens in Egypt, and a few did succeed in being hatched, but Arabs being totally ignorant of the principles of the oven-hatching, they subjected them to the same conditions as fowl's eggs—hence the failure of the greater number. But that they might be hatched artificially was evident from some of the eggs which were put in having been hatched. By this means the supply of turkeys would also be cheap and abundant.

I have no doubt that if this artificial hatching of turkeys as well as fowls were introduced into any country, and commonly adopted in farm houses, it would tend greatly to the advantage of the land.

References to the Plate.

Fig.

1st. General plan of the oven.
2d. Section of the corridor F G H I.
3d. Section of one cell in the direction of the corridor F G H I.
4th Section of one cell in the direction of the corridor A B C D.
5th. Floor of the upper story of one cell.
6th. Floor of the upper story of the cell Y.
7th. Floor of the under story of a cell.
8th. Floor of the under story of a cell after the 14th day.
9th Floor of the upper story of a cell after the 14th day.

ART. VII.—*Report on the Mortality among Officers and Men in H. M. Service in Bengal, and on the comparative salubrity of different Stations. By the late Dr.* W. A. BURKE, *Inspector-General of Hospitals.**

To W. W. BIRD, ESQ.

President of the Committee for the Insurance of Lives in India.

SIR,

I have the honor to acknowledge the receipt of your letter, which a protracted and severe illness prevented my replying to as soon as I could have wished. I shall now endeavour as far as possible to comply with the request of the Committee in affording all the information in my power regarding mortality in the rank of officers as well as men

* For this very valuable paper we are indebted to Mr. Martin, the Surgeon to the Native Hospital of Calcutta. Dr. Burke's tabulated returns form an important addition to our knowledge of the laws of vital statistics. In connexion with this paper the reader should consult Mr. H. T. Prinsep's paper on the "Value of Life in the Civil Service."—*Journal of the Asiatic Society*, 1832, p. 277, and 1837, p. 341; and his "Table of Mortality," founded on the registers of the Lower Orphan School, 1838, p. 818.—ED.